MODELS, PHILOSOPHY OF SCIENCE, AND LOGIC

How to teach these subjects to undergraduate Philosophy students

Vittorio Pastelli

My experience on the first day as an instructor almost always is: I encounter undergraduate Philosophy students and see they have lots of difficulty when formalisms are presented to them. A very common reaction is: "I thought I would never see these subjects again after high-school. I deeply dislike maths. I'm a humanist. What are these subjects doing here?" And things get worse when we move to Philosophy of Science. The situation is overall very understandable if you sit back and ponder:

1) Philosophy students are not naturally prone to anything akin to maths and, in fact, to any formal presentation whatever the subject. They class them as "reductions" from true knowledge, as lazy abstractions tailored to avoid the complexity of real human endeavors;

2) Science gives an image of itself as a "truth-providing" activity. This is the image we see on the press, TV or social media. Science as an activity more devoted to question and method than to

answers and truth is something few groups (of non-scientists) are aware of. Among our freshmen teenagers, the truth-providing image is predominant. And we must cope with that. Simply avoiding this by saying "it's popular culture and unreasoned knowledge" will not do the trick.

And now enters Phi-Sci + Logic. When we get to modern authors like Thomas Kuhn, Paul Feyerabend or Imre Lakatos, we must keep in mind their work is in great part an answer to Karl Popper and to the logical positivists. Even in an epoch of computer simulation and the blurring of the frontier between theory and scientific practice, we must go back to these classical authors if we are to understand the more recent and subtle questions.

These are the reasons I came to consider the concept of "model" as central to introduce these disciplines. Models are common enough in daily life: a map of subway lines, an infographic on a site &c. People know they represent something but in abstract form. And they know there can be more than one way to abstract the reality in order to build a model.

Going on in preliminary classes, exploring different types of models, specially graphics, but considering other forms of visual transmission of compacted content (like infographics, animated or not), we carry the student smoothly from the preconceptions listed

above, (1) and (2), to familiarity with models and all the knowledge inbuilt and enabled by them.

An important source of ideas to approach models for these undergraduates is given by literature (high and even low-brow genre science fiction). Take for instance the fable about cartographers, by Argentinian author Jorge Luís Borges. These men want to build a map so perfect that they finally realize it must be of the same size of the country mapped. It is the paradox of modeling. We can go even further: to capture the complexity of a country, even this fabled map would not do, for to understand something we must take into account its development in time. Readings like this, and there are plenty around, motivate students to see the limits and open possibilities models offer.

Now, after this eminently hands-on approach (yes, we make exercises on compacting data in graphic models), we are free to talk about Philosophy of Science as a very abstract discussion on... models. And further, to talk on Logic as a tool to model our thoughts. From this to the formalism involved in propositional and first order predicate calculus the way is fast and clear.

Bibliography

All the bibliography on classical themes is well known. Basic Logic manuals abound and each instructor can choose what he or she thinks fits best for their students.

Literary examples range from the cited Jorge Luís Borges to authors like Stanislaw Lem (epecially "Solaris") to classical ones like Gustave Flaubert whose "Bouvard and Pècuchet" discusses at length the limits of representations of the real world by textbooks.

Special attention must be given to ways to convey data. For this, I strongly suggest all the books by designer and statiscian Edward Tufte, specially "Envisioning Information". To update Tufte, who works only on what can be shown on paper, please consider the introductory literature on visualization, which can be obtained from traditional media (books) or websites. Some of these have hands-on opportunities to build and test models. See, for instance, http://lab.culturalanalytics.info/.

Please refer, for a more dense approach, to my paper "Modelos e Lógica" on academia site .

On the links between literature and thought-experiments, please refer to my paper "Antiutopias" on academia site.

An example of a thought-experiment on models discussed by an influential philosopher can be found in my translation of W.V.O. Quine on academia site ("Encontro entre Quine e Borges na Biblioteca de Babel").